

THE "N" RAYS.

A Collection of Papers communicated to the Academy of Sciences, with Additional Notes and Instructions for the Construction of Phosphorescent Screens. By Prof. R. Blondlot. Translated by J. Garcin. Pp. xii+83. (London: Longmans, Green and Co., 1905.) Price 3s. 6d. net.

THE *n*-rays, so called because the first announcement of their existence came from Nancy, have attracted the attention of physicists and physiologists all over the world; but the peculiarity about them is that the phenomena said to be produced by these rays when they fall on a slightly fluorescing screen have been observed chiefly in France by Prof. Blondlot and others of his school, while many experienced observers in Germany, America, and England have wholly failed to obtain a satisfactory demonstration even of their existence. The reason is that the so-called proof of their existence depends, not on objective phenomena that can be critically examined, but on a subjective impression on the mind of the experimenter, who sees, or imagines he sees, or imagines he does not see, a slight change in the degree of luminosity of a phosphorescent screen. It is true that, more than once, a photograph has been taken of such a screen supposed to be unaffected and contrasted with a photograph of the same screen when it was supposed to be affected by the rays, with the result that the patch of luminous surface appears to be a little brighter in the latter case than in the former. Even this photographic evidence, however, is unsatisfactory, as a slight difference in the time of exposure or in the method of development would readily account for the apparent contrast.

Yet, in this little book, we have a reprint of Prof. Blondlot's original papers, in which experimental evidence is adduced, with a wonderful appearance of accuracy in detail, of the polarisation of the rays, of their dispersion, of their wave-length, and of other physical phenomena attributed to them. Prof. Blondlot's experiments are well contrived, and they give every appearance of being arrangements by which accurate data should be obtained; but in every case the ultimate test is the subjective one made on the mind of the observer as to whether a spot of slightly phosphorescent surface becomes more luminous or not. The *n*-rays, according to Prof. Blondlot, are a new species of light, light, however, which only affects the retina with the aid of a fluorescent substance. They traverse many metals, black paper, wood, &c. They cannot pass through sheet lead, but they pass readily through aluminium. They influence not only a fluorescent substance, but the spark of an induction coil. They can be reflected from a polished glass surface or from a plate of polished silver. They have a kinship with well known radiations of a large wave-length. They exist in solar rays. Produced from an Auer burner they can be focused by a quartz lens; the lens itself may even become a source of *n*-rays.

Calcium sulphide can store up the rays, while
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aluminium, wood, dry or wet paper cannot do so. Ordinary light, when it falls on the retina, causes a more luminous sensation when accompanied by *n*-rays. Bits of wood, glass, rubber, &c., emit the rays when compressed. Bodies in molecular strain, like Rupert's drops, hardened steel, &c., emit the rays. An old knife, found in a Gallo-Roman tomb, equally with a new knife, sends out rays. There are other rays also, which must be called *n*₁-rays, which are emitted from a Nernst lamp. These diminish the glow of an induction spark. Ethylic ether, "when brought to a state of forced extension," emits the *n*₁-rays, &c.

To see all these wonderful phenomena the eye must be not only kept in the dark for a considerable time, but it must be specially trained. A. Broca states that in his own case it required practice for six weeks before he could see the effect of the rays. The eye must be adapted not only to darkness, but to very feeble light. The mind must be free, so as to concentrate itself on the observation to be made. These seem to be admirable arrangements for obtaining an illusive subjective impression! It is said that MM. d'Arsonval and Mascart have also observed some of the phenomena. Many other French observers, with less weighty names, have also been cited as witnesses. The general body of men of science are doubtful, as they cannot receive evidence of such a strangely subjective character, while not a few, and the writer places himself in this category, are of opinion that while they do not for a moment reflect on the *bona fides* of the French observers, they hold that these observers have been the subjects either of an illusion of the senses or a delusion of the mind.

JOHN G. MCKENDRICK.

THE SCIENCE OF EDUCATION.

School Teaching and School Reform. By Sir Oliver Lodge. Pp. viii+171. (London: Williams and Norgate, 1905.) Price 3s.

THE science of education is as yet rudimentary and ill-defined. So little has it developed, indeed, that many schoolmasters deny its existence. An art of education they recognise, and that they claim to practise. Teachers, it is urged, are born, not made, and professional training is useless. Yet it is the possibility of the future existence of a complete science of education which is the inspiring belief of the best modern educators. These teachers are now approaching the problems of the class-room and the difficulties of school organisation as subjects for investigation and experiment by scientific methods, and there is every reason for hopefulness in the results which have been obtained in recent years.

The formulation of the fundamental principles of a complete science of education will probably be the work of some great educationist as yet unborn, who will be able from the educational material at his command to extract the essentials and to weave them into living generalisations round which the science will crystallise into an orderly and harmonious whole. To the elucidation of such a science many workers

must contribute, and to ensure success men both familiar with science and aware of the difficulties with which teachers have to cope must lend their aid. It is for this reason we welcome these lectures by Sir Oliver Lodge, representing as they do the experience gained by a man of science in many departments of work.

The lectures range over a great variety of topics, and the subjects are presented with but little arrangement. But informal and disconnected though they are, the chapters will cause earnest teachers to reconsider their methods, and strenuously to strive after the improvements adumbrated. Sir Oliver Lodge rightly affirms that the two most important questions for educators to-day are, "What subjects should be selected for teaching?" and "How should they be taught?" But these are precisely the problems teachers have had to face since the Renascence, and we seem little nearer solutions than were the educators of three hundred years ago. A complete answer to the questions propounded will remain impossible until psychology has demonstrated the precise stages in the growth of the immature human intelligence and determined what instruction will assist best each step of such development. For psychology to accomplish this task many carefully planned experiments, carried out by practical teachers imbued with the scientific spirit, are necessary, and the results arrived at must be chronicled and subjected to the most searching criticism.

Mere expressions of opinion will not greatly assist the coming of the new science. What is wanted is investigation. If the man of science will cooperate with the practical schoolmaster, there is no reason why it should not be possible to answer the two vital questions re-stated by Sir Oliver Lodge. But it is imperative that we formulate, after exhaustive discussion, clearly defined problems to be put to the test of experience in schools, and that when we have agreed upon the results we act upon them. It is in this direction that the most fruitful work for education is to be done.

It is unnecessary to summarise the contents of the lectures before us. It is sufficient to say they touch upon the whole field of education. Sir Oliver Lodge is always suggestive, and his *obiter dicta* may be commended to the attention of men of science and school teachers alike. Of all the subjects calling for scientific study and research, the education of the young is the most important. This deserves pre-eminently to occupy the serious attention of all who desire the well being of the human race. A. T. S.

BRITISH BIRDS.

British Bird Life. By W. Percival Westell. Pp. xxxv + 338. (London: T. Fisher Unwin, 1905.) Price 5s.

THE wearisome procession of books on British birds still drags on—a long train of volumes, all of necessity telling the same tale, and for the most part badly. The laboured apologies which most of

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these weaklings bring with them show, indeed, that their respective parents realise how slender is the chance of their finding favour even at the hands of a public proverbially long-suffering. Yet still they come.

The present volume endeavours to justify its existence on the plea that "there is need for a work *entirely devoted to those species which nest amongst us year by year . . .*"; and yet a number of species are included in this book which, on the author's own admission, do *not* breed with us year by year. Such are the Canada goose, little owl, golden oriole, hoopoe, and fire-crested wren. To these may be added the white-tailed eagle, spotted crake, roseate tern, and quail! On the other hand, there is reason to believe that the snow-bunting—included in this book—nests annually in Scotland, yet this fact is not even hinted at.

No more trustworthy are the author's statements as to "where our summer migrants spend the winter."

While we heartily agree with much that Mr. Westell has to say on the subject of the relentless persecution which of late years has been meted out to the birds of prey, we must protest against the hysterical notions of justice which he expresses in regard to a case wherein four men were fined thirty shillings apiece for taking a nest of young peregrines "A good dose of the cat," he contends, "or imprisonment without the option of a fine, would probably have had a better effect than a fine of a few shillings"!

As touching this same species, the author gravely assures us that falconry is "a very costly hobby, even the most ordinary Hawks used for falconry costing as much as 100*l.* apiece. They require the most careful attention, and it is difficult to get men qualified to take charge of them under a salary of, say 200*l.* a year."

The photograph purporting to be that of a sparrow hawk is really a picture of a kestrel.

At times Mr. Westell becomes ecstatic, and, blinded by the intensity of his emotions, rushes onwards regardless of obstacles—even of the rules of grammar—as witness the peroration which forms the concluding paragraph of his book:—

"For the good most birds do, for their cheery voices and winning ways, their charming forms and delicate colouring, their beautifully woven nests and exquisite eggs, their fairy-like flight, and other interesting characteristics, I appeal to my readers to study them with a bloodless intention, and to endeavour to learn practical lessons from their industry and devotion to their young; to study them as animate beings, and not as gazed upon as wretched caricatures of bird-life too often found in Museums and collections, and to endeavour to be of some service in specially inculcating and fostering within young and growing children an intelligent love for the bird life of our country"!!

This book is profusely illustrated, partly by photographs, some of which are very pleasing, and partly by "original" drawings, all of which are bad.

W. P. P.